



Uranium Mines

Uranium has been used in a variety of industrial and research processes. For example, uranium has been used as a coloring agent in decorative glass and ceramics, with uranium coloring found in glass from 79 AD. However, the greatest uses of uranium by far have been for defense and electric power generation.

The U.S. mining industry uses two distinct methods to extract uranium ore: physically removing the ore-bearing rock from the soil for processing or chemically dissolving uranium from the ore at the site.

Physically removing the rock ore generally involves either open-pit mining or underground mining.

- Open-pit mining is stripping away or excavating the topsoil and rock that lie above the uranium ore.
- Underground mining is extracting rock through a tunnel or opening the side of a hill or mountain.

Chemically dissolving the uranium out of the rock ore is done through either heap leaching or in-situ leaching.

- Heap leaching is pouring chemicals over above-ground piles of crushed ore-bearing rock and collecting uranium through underground drains. This method is not used currently in the U.S.
- In-situ leaching, the most common method used in the United States, involves treating ore deep underground with chemicals to dissolve the uranium and then pumping the liquid to the surface through wells.

The soils in these areas also contain uranium and radium, naturally-occurring radioactive materials (NORM). Once exposed or concentrated by mining, this naturally-occurring material becomes Technologically-Enhanced NORM or TENORM. TENORM at mining sites consists of radioactive waste soils and rock, drill and corehole cuttings, and waste waters. Wastes at heap leaching or in-situ leaching operations are regulated by the U.S. Nuclear Regulatory Commission or its Agreement States and are classified as by-product materials rather than TENORM.

Milling is the process that removes uranium from the ore, which is mostly obtained in open-pit and underground mines. Once at the mill, the ore is crushed and ground up, and treated with chemical solutions to dissolve the uranium, which is then recovered from the solution. Tailings are the wastes from the millings processes and are stored in mill tailings impoundments, a specially designed waste disposal facility. These wastes are also classified as by-product materials.

Since 1879, when uranium mine workers began being diagnosed with lung diseases, such as cancer, regulators have gradually tightened controls and mandated improved uranium mining practices. Recently, officials also have become concerned with the broader impacts of uranium mining on public health and the environment.

Workers are directly exposed to the radiation hazards of uranium mines. There are radiation protection standards in place specifically to protect uranium mine workers.

Radiation and Mining

Uranium mining releases radon from the ground into the atmosphere. Open-pit and in-situ mining sites have been monitored by federal agencies and found to pose a low risk to the public. However, underground mines potentially pose a higher radon risk to both the public and workers. Mines and mining waste can release radionuclides, including radon, and other pollutants to streams, springs, and other bodies of water. Federal and state agencies have established pollutant discharge limits and drinking water standards, and continue to monitor these sites for public safety.

Uranium mine waste from operations that closed before the mid-1970s are of particular concern. In many cases, these mines remain unclaimed and the waste is still piled near the mine. Weathering can lead to

radioactive dust that is blown by the wind and the seepage of contaminants into the surface and groundwater. There are also cases of unclaimed uranium mine waste being used for house construction, which creates significant radon and radiation hazard for inhabitants.

Radiation and Milling

Although the milling process recovers about 95 percent of the uranium present in ores, the residues, or tailings, contain several naturally-occurring radioactive elements, including uranium, thorium, radium, polonium, and radon. They also contain a number of chemically hazardous elements, such as arsenic. Past use of mill tailings for house, school, road, and other construction created public radiation health hazards. Those practices have been ended by the Uranium Mill Tailings Radiation Control Act which has been implemented by federal and state agencies.

Who is protecting you

U.S. Environmental Protection Agency (EPA)

EPA established environmental protection standards for mill tailings under requirements of the Uranium Mill Tailings Radiation Control Act (UMTRCA).

EPA also has other standards and special programs that control radiation in operating mines and mills, in some old mines and mills, and in associated uranium-based products.

U.S. Nuclear Regulatory Commission (NRC)

NRC, or its Agreement States, license and oversee the operations of mills, heap, and in-situ leaching solution mines.

Mill sites regulated NRC, NRC Agreement States, and the U.S. Department of Energy have waste holding areas under environmental protection standards established by EPA. Constructed

The States

Many states have signed formal agreements with NRC, delegating to the states regulatory authority over the licensing and operations of mills and in-situ leaching solution mines.

U.S. Department of Labor (DOL), Mine Safety and Health Administration (MSHA)

MSHA enforces compliance with mandatory safety and health standards to eliminate fatal accidents, reduce the frequency and severity of nonfatal accidents, minimize health hazards, and promote improved safety and health conditions in the nation's mines.

U.S. Department of Energy (DOE)

DOE takes control of closed and reclaimed mills, and reclaims some mill sites as authorized by Congress.

U.S. Department of the Interior (DOI), Bureau of Land Management (BLM)

BLM is responsible for managing 262 million acres of land--about one-eighth of the land in the United States--and about 300 million additional acres of subsurface mineral resources, including mines. The Office of Surface Mining provides funds to many state and tribal agencies for reclaiming uranium mines on their land for safety purposes.

U.S. Department of Agriculture (USDA), National Forest Service (NFS)

NFS reclaims abandoned mines in national forests.

U.S. Army Corps of Engineers (USACE)

The Corps of Engineers operates the Formerly Utilized Site Remedial Action Program (FUSRAP), which was originally established by DOE in 1974 to identify, investigate, and clean up contaminated sites formerly used by DOE's predecessor agencies. In some cases, these sites include mining and milling sites with radioactivity in levels above today's standards. FUSRAP covers many sites, including sites from the early years of the nation's atomic energy program. Through the FUSRAP, Federal agencies, state and local governments, and property owners work together to keep radioactive material on these sites under control. The Corps of Engineers has also assisted EPA and tribes in cleanup of abandoned mines on tribal properties.

What can you do to protect yourself

Government organizations continue to address potential threats from the uranium mining industry for the public health and safety but you can take actions as well for your own health and safety.

Workers in the industry have the potential for overexposure to radioactive material and must stay up-to-date on federal, state and industry health and safety guidelines. Following these procedures will reduce total on-site exposure. Workers also need to take precautions to avoid bringing radioactive material residue on their clothes and shoes home to their families and neighborhoods.

- Remove potentially contaminated clothes and shoes before returning to the family car and to your home or office.
- Do not bring home discarded equipment or material used at sites such as pipes, devices, bricks, rocks, and water or re-use these materials as containers or as building materials.

Members of the public should contact their local state geological survey or bureau of health to determine if there may be NORM and TENORM associated with uranium mining in their state or area where they live. Until then:

- Limit exposures and disturbance of the production site and any abandoned equipment.
- Do not handle, dispose, or re-use abandoned equipment from uranium mining sites.

You should never:

- Swim or drink the water from open pit mine lakes.
- Drink the water from streams and springs near abandoned uranium mines.
- Remove rock or soil from a uranium mine site for re-use or recycling for building construction.
- Take the rocks home as samples of souvenirs.

Resources

You can explore this radiation source further through the resources at the following URL:

<http://www.epa.gov/radtown/uranium-mines.htm#resources>

We provide these resources on-line rather than here so we can keep the links up-to-date.